

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Megalagrion nesiotes*

COMMON NAME: Flying earwig Hawaiian Damselfly

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: September 2005

STATUS/ACTION:

_____ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

_____ New candidate

 X Continuing candidate

_____ Non-petitioned

 X Petitioned - Date petition received: May 11, 2004

_____ 90-day positive - FR date:

 X 12-month warranted but precluded - FR date: May 11, 2005

 N Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded: We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs). During the past 12 months, most of our national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations, and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (<http://endangered.fws.gov/>).

_____ Listing priority change

Former LP: _____

New LP: _____

Date when the species first became a Candidate (as currently defined): 2/28/1996

_____ Candidate removal: Former LP: _____

_____ A – Taxon is more abundant or widespread than previously believed or not subject to

the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

- ☐ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
- ☐ F – Range is no longer a U.S. territory.
- ☐ I – Insufficient information exists on biological vulnerability and threats to support listing.
- ☐ M – Taxon mistakenly included in past notice of review.
- ☐ N – Taxon does not meet the Act’s definition of “species.”
- ☐ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Insects; Family Coenagrionidae (damselfly)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, islands of Maui and Hawaii

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, island of Maui

LAND OWNERSHIP

The one known population of the flying earwig Hawaiian damselfly occurs along East Wailua Iki Stream on State land on the island of Maui.

LEAD REGION CONTACT: Paul Phifer (503) 872-2823, paul_phifer@fws.gov

LEAD FIELD OFFICE CONTACT: Pacific Islands Fish & Wildlife Office, Lorena Wada, (808) 792-9400, lorena_wada@fws.gov

BIOLOGICAL INFORMATION

Species Description: The flying earwig Hawaiian damselfly (*Megalagrion nesiotes*) is a large and elongated species. The males are blue and black in color and exhibit greatly enlarged, pincer-like male superior appendages (structures used to clasp the female during mating). Females are predominantly brownish in color. The adults measure from 46-50 millimeters (mm) (1.8-1.9 inches (in)) in length and have a wingspan of 50-53 mm (1.9-2.1 in). Larvae of this species have never been collected or found (Asquith and Polhemus 1996).

Taxonomy: The flying earwig Hawaiian damselfly was first described from Puna, Hawaii Island by R.C.L. Perkins (1899), and the species is recognized as a distinct taxon (Asquith and Polhemus 1996). Perkins is the most recent and accepted taxonomic write up for this species.

Habitat: Little is known about the biology of the flying earwig Hawaiian damselfly, but it is not associated with standing or flowing water (Perkins 1899; Polhemus 1994). The only known population occurs along a steep, moist, talus slope, densely covered with *Dicranopteris linearis* (uluhe) and *Rubus* sp. (blackberry). Adults are usually seen perched on vegetation, and fly

slowly and only short distances. When disturbed, the adults actually fly into the tangled vegetation rather than up and away as in the aquatic Hawaiian damselflies. Although immature stages have not been found, based on the habitat and the behavior of the adults, it is believed that the naiads are terrestrial or semi-terrestrial, occurring among the damp leaf litter (Kennedy 1934; Polhemus 1994).

Historic and Current Range/Distribution: Historically, the flying earwig Hawaiian damselfly was known from the following general localities: Kau (Polhemus 1994, Perkins 1899), Kilauea (Perkins 1907), Olaa, and Kona (Perkins 1899) on the island of Hawaii, and Haipuaena, Honomanu, Kailua, and Keanae on windward East Maui (Kennedy 1934). Despite extensive surveys for damselflies recently on the island of Hawaii (Polhemus 1994), this species has not been seen since 1906 and is probably extirpated on that island. Likewise on Maui, this species has not been seen at its historical localities, and the only known population occurs along East Wailua Iki Stream (Polhemus 1994).

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range. Animals such as pigs, goats, axis deer, black-tailed deer, and cattle were introduced either by the early Hawaiians (pigs) or more recently by European settlers (all ungulate species) for food and/or commercial ranching activities. Over the 200 years following their introduction, their numbers increased and the adverse impacts of feral ungulates on native vegetation have become increasingly apparent. Beyond the direct effect of trampling and grazing native plants, feral ungulates have contributed significantly to the heavy erosion still taking place on most of the main Hawaiian Islands.

Pigs (*Sus scrofa*), originally native to Europe, Africa, and Asia, were introduced to Hawaii by the Polynesian ancestors of Hawaiians, and later by western immigrants. The pigs escaped domestication and invaded primarily wet and mesic forests and grasslands of Kauai, Oahu, Molokai, Maui, and Hawaii. They presently threaten the existence of the flying earwig damselfly in mesic forest on Maui. While foraging, pigs root and trample the forest floor, encouraging the establishment of nonnative plants in the newly disturbed soil. In moist depressions, pigs completely remove all vegetation by wallowing, leaving nothing but mud and water (Stone 1985; Cuddihy and Stone 1990). Pigs are degrading the habitat of the flying earwig Hawaiian damselfly on Maui.

Changes in water quality from upstream uses, such as dewatering and diversions, also affect the habitat of the flying earwig Hawaiian damselfly (D. Preston, Bishop Museum, pers. comm. 2005).

No conservation measures have been taken to address these threats for this species.

B. Over-utilization for commercial, recreational, scientific, or educational purposes. The East Wailua Iki Stream lies near a major highway and is under pressure by intermittent recreational use (Polhemus 2004). No conservation measures have been taken to address this threat.

C. Disease or predation.

The geographic isolation of the Hawaiian Islands has restricted the number of original successful colonizing arthropods and resulted in the evolution of a unique fauna. An unusually small number (15 percent) of the known families of insects are represented by native Hawaiian species (Howarth 1990). Entirely absent are some groups that often dominate continental arthropod faunal groups such as social Hymenoptera (group nesting ants, bees, and wasps). Commercial shipping and air cargo to Hawaii has now resulted in the establishment of over 3,372 species of nonnative insects (Howarth 1990; Howarth *et al.* 1994; Staples and Cowie 2001), with a continuing establishment rate of 20 to 30 new species per year (Beardsley 1962, 1979; Staples and Cowie 2001). In addition to the accidental establishment of nonnative species, nonnative predators and parasites for biological control of pests have been purposefully imported and released by individuals, Republic, Territorial, State, and Federal agencies, since 1865. Between 1890 and 2004, 387 nonnative species were introduced, sometimes with the specific intent of reducing populations of native Hawaiian insects (Funasaki *et al.* 1988; Lai 1988; Staples and Cowie 2001). Nonnative arthropods, whether purposefully introduced or adventive, pose a serious threat to Hawaii's native damselflies, through direct predation, and competition for food or space (Howarth and Medeiros 1989; Howarth and Ramsay 1991; Staples and Cowie 2001).

Ants can be particularly destructive predators because of their high densities, recruitment behavior, aggressiveness, and broad range of diet (Reimer 1993). Because they are generalist feeders, ants may affect prey populations independent of prey density, and may locate and destroy isolated individuals and populations (Nafus 1993a). At least 36 species of ants are known to be established in the Hawaiian Islands, and at least 3 particularly aggressive species have severely affected the native insect fauna (Zimmerman 1948b). Most ant species have winged reproductive adults and once established anywhere in the State, they are likely to colonize suitable habitats on all islands in time.

By the late 1870s, the big-headed ant (*Pheidole megacephala*) was present in Hawaii and its predation on native insects was noted by Perkins (1913) who stated, "it may be said that no native Hawaiian Coleoptera insect can resist this predator, and it is practically useless to attempt to collect where it is well established. Just on the limits of its range one may occasionally meet with a few native beetles, *e.g.*, species of *Plagithmysus*, often with these ants attached to their legs and bodies, but sooner or later they are quite exterminated from these localities."

With few exceptions, in Hawaiian habitats where the big-headed ant is present, native insects are eliminated (Perkins 1913; Gagne 1979; Gillespie and Reimer 1993). The big-headed ant generally does not occur at elevations higher than 600 meters (2,000 feet), and is also restricted by rainfall, rarely being found in particularly dry (less than 35 to 50 centimeters (15 to 20 inches) annually) or wet areas (more than 250 centimeters (100 inches) annually) (Reimer *et al.* 1990). The big-headed ant is also known to be a predator of eggs and caterpillars of native Lepidoptera, and can completely exterminate populations (Zimmerman 1958).

The Argentine ant (*Iridomyrmex humilis*) was discovered on the island of Oahu in 1940 (Zimmerman 1941) and is now established on seven main islands. Unlike the big-headed ant, the Argentine ant is primarily confined to elevations higher than 500 meters (1,600 feet) in areas of moderate rainfall (Reimer *et al.* 1990). This species can reduce or even eliminate populations of native arthropods at high elevations in Haleakala National Park on Maui (Cole *et al.* 1992). On Maui, Argentine ants are significant predators on pest fruit flies (Wong *et al.* 1984). Argentine ants have also been reported on the islands of Kahoolawe and Hawaii (A. Asquith, Hawaii Sea Grant Program, pers. comm., 1998; A. Medeiros, pers. comm., 1998).

The long-legged ant (*Anoplolepis longipes*) appeared in the State in 1952 and now occurs on Oahu, Maui, and Hawaii (Reimer *et al.* 1990). It inhabits elevations under 600 meters (2,000 feet), in rocky areas with low to high annual rainfall (Reimer *et al.* 1990). Direct observations indicate that Hawaiian arthropods are susceptible to predation by this species (Gillespie and Reimer 1993) and Hardy (1979) documented the disappearance of most native insects from Puaaluu in the Kipahulu District on Maui after the area was invaded by the long-legged ant.

At least two species of fire ants, *Solenopsis geminata* and *S. papuana*, are also significant threats (Reagan 1986; Gillespie and Reimer 1993) and occur on the seven main islands (Reimer *et al.* 1990). Ants, including the fire ant *S. geminata* are known to be the most significant and consistent mortality factor on eggs, and probably larvae, of the butterfly *Hypolimnas bolina* (common eggfly) in Guam, even where both predator and prey are native (Nafus 1993a, b). *Solenopsis geminata* is also known to be a significant predator on pest fruit flies in Hawaii (Wong and Wong 1988). *Solenopsis papuana* is the only abundant, aggressive ant that has invaded intact mesic forest above 600 meters (2,000 feet) and is still expanding its range in Hawaii (Reimer 1993).

Fortuitously, the red imported fire ant (RIFA) (*Solenopsis invicta*) has not yet made its way to the Hawaiian Islands, at least there are no documented occurrence of this species in Hawaii. Slowly spreading through the southeast region of the mainland U.S. since the 1930s, RIFA has in recent years become established in California where it is causing significant problems for wildlife, agriculture, and quality of life (Jetter *et al.* 2002). Based upon what we know of RIFA's effects on the mainland U.S. and elsewhere, this species of fire ant would undoubtedly prey upon Hawaii's native insect fauna (Brinkley *et al.* 1991; Allen *et al.* 1994; Jetter *et al.* 2002). Recently, the Hawaii Department of Health has taken a more proactive approach to the RIFA threat in developing a strategy for preventing the species' establishment and also a contingency plan for addressing the potential scenario in the event of an unfortunate establishment (Hawaii Ant Group 2001). The possibility of RIFA becoming established is a serious potential threat (Hawaii Ant Group 2001).

Predation from nonnative birds such as bulbuls, cardinals and mynas may also pose a threat to all life phases of the flying earwig Hawaiian damselfly (D. Preston, Bishop Museum, pers. comm. 2005).

The threat of predatory birds and nonnative arthropods has affected the survival of the flying earwig Hawaiian damselfly. Nonnative arthropods pose a serious threat to Hawaii's native damselflies through direct predation and competition for food or space. No conservation measures have been taken to address these threats for this species.

D. The inadequacy of existing regulatory mechanisms.

We are unaware of any current, existing regulatory mechanisms for the protection of this species.

E. Other natural or manmade factors affecting its continued existence.

Even if the threats responsible for the decline of this species were controlled, the persistence of existing populations is hampered by the small number of extant populations and the small geographic range of the known populations. This circumstance makes the species more vulnerable to extinction due to a variety of natural processes. Small populations are particularly vulnerable to reduced reproductive vigor caused by inbreeding depression, and they may suffer a loss of genetic variability over time due to random genetic drift, resulting in decreased evolutionary potential and ability to cope with environmental change (Lande 1988; Center for Conservation Update 1994). Small populations are also demographically vulnerable to extinction caused by random fluctuations in population size and sex ratio and to catastrophes such as hurricanes, landslides, and flashfloods (Lande 1988; D. Preston, Bishop Museum, pers. comm. 2005). No conservation measures have been taken to address these threats for the flying earwig Hawaiian damselfly.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

Translocation efforts of the orangeblack damselfly (*Megalagrion xanthomelas*) were initiated again in July 2003. It is hoped that information gained from these efforts can then be applied in the conservation of all damselflies.

SUMMARY OF THREATS

The greatest threats to the flying earwig Hawaiian damselfly are loss of suitable habitat, predation by nonnative arthropods, and vulnerability to stochastic events. There are no efforts being undertaken to address these threats for this species.

LISTING PRIORITY:

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2 *
	Non-imminent	Subspecies/population	3
		Monotypic genus	4
		Species	5
		Subspecies/population	6

Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Rationale for listing priority number:

Magnitude:

This species is highly threatened throughout its extremely limited range by habitat loss and by predation from ants and other nonnative arthropods. These threats occur range-wide and there are no efforts being done to control or eradicate these nonnative species.

Imminence:

Threats to the flying earwig Hawaiian damselfly from nonnative arthropods and ungulate-caused habitat impacts are considered imminent because they are on-going.

Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed? yes

Is Emergency Listing Warranted? No. The species does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the time frame of the routine listing process. If it becomes apparent that the routine listing process is not sufficient to prevent large losses that may result in this species' extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of the flying earwig Hawaiian damselfly as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

DESCRIPTION OF MONITORING

We conducted literature searches for recent articles on this species and contacted relevant species experts, U.S. Geological Survey-Biological Resources Discipline, U.S. Army, State officials with the Department of Land and Natural Resources, and Bishop Museum, University of Hawaii and National Museum of Natural History researchers regarding the current status of this species. The literature search revealed that this species was collected during surveys for it on the island of Maui during the years 2000, 2001, and 2002 at East Wailua Iki Stream; and was not collected at the same location in the year 2003 (Englund *et al.* 2003).

This level of monitoring is appropriate to update the status of this species because a thorough literature search was conducted as well as relevant species experts contacted. Information

contained in this assessment form was verified and any updated information incorporated. The Hawaii Biodiversity and Mapping Program lists this species as critically imperiled (Hawaii Biodiversity and Mapping Program database 2004). This species is not listed in the International Union for Conservation of Nature and Natural Resources Red Data List database (International Union for Conservation of Nature and Natural Resources database 2004).

List of Experts Contacted:

Name	Date	Place of Employment
Adam Asquith	July 12, 2005	University of Hawaii
Vince Costello	July 13, 2005	U.S. Army
Ronald Englund	July 12, 2005	Bishop Museum
David Foote	July 12, 2005	U.S. Geological Survey_BRD
Betsy Gagne	July 12, 2005	Hawaii Dept of Land and Natural Resources
Michael Kido	July 12, 2005	University of Hawaii
Robert Nishimoto	July 13, 2005	Hawaii Dept of Land and Natural Resources
David Preston	July 12, 2005	Bishop Museum
Dan Polhemus	July 12, 2005	National Museum of Natural History

List of Databases Searched:

Name	Date
Hawaii Biodiversity and Mapping Program	2004
International Union for Conservation of Nature and Natural Resources database	2004

COORDINATION WITH STATES

In October 2004 we provided the Division of Forestry and Wildlife Administrator, Paul Conry, with copies of our most recent candidate assessment forms for his review and comment. In addition, copies of the candidate forms were sent to Betsy Gagne, Executive Secretary for the Hawaii Natural Area Reserves System Commission. Ms. Gagne reviewed the information for this species and provided no additional information or corrections (B. Gagne, pers. comm. 2005).

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: **Acting** David W. Winkler
Regional Director, Fish and Wildlife Service

11/12/05
Date

Marshall P. Jones

Concur: _____
Director, Fish and Wildlife Service

August 23, 2006
Date

Do not concur: _____
Director, Fish and Wildlife Service

Date

Date of annual review: 8/4/05

Conducted by: Lorena Wada, Pacific Islands FWO

Comments:

PIFWO Review

Reviewed by: Gina Shultz
Assistant Field Supervisor, Endangered Species

Date: 10/12/05

Patrick Leonard
Field Supervisor

Date: 10/11/05